C-9 Final Report
Battle Academy
Chattanooga, Tenn.
Submitted by: Debbie Rosenow

Flying on the C-9 was an experience of a lifetime. Not only was it incredibly fun and eventful, it was also an incredible learning experience. The opportunity to participate in the Reduced Gravity program has impacted our students, our community, as well as our teaching practices.

I. Goal/Purpose of Investigation

A. To investigate how fluids of various viscosities would react in a microgravity environment.
B. To increase student participation and interest in science experimentation.

II. Investigation Results/Data

The fluids in our experiment did react to the microgravity environment, but not by forming spheres. The fluids went through what is called "wetting". Dan Adamek explained to the students that the surface tension of the fluids caused them to be more attracted to the sides of the containers than to the air inside the container. This is why spheres did not form within the containers.

During the zero-G phases the fluids pulled tightly together and then traveled around the inside of the containers. The water that had soap added to it to break down some of the surface tension reacted in the same way, but spread out more than any of the other fluids. There was no observable difference between the fluids with higher viscosities vs. lower ones. There was little reaction from the fluids that were tested during the Mars and Lunar parabolas. We did observe a difference in the reaction liquids from Day 1 of the flight to Day 2 because the volume of the fluid had been increased which made it easier to observe the reaction of the fluids during flight.

III. Investigation Conclusion

It was concluded by students who observed the video footage of the experiment that spheres do not automatically form from a liquid simply because the liquid is in microgravity. Surface tension of a liquid plays a huge role in how a liquid will react in a reduced gravity environment.

After learning more about the wetting process it was also concluded that spheres might have formed had the containers been coated on the inside with a substance such as Chapstick or wax which would have caused the fluids to be more resistant in clinging to the inside of the container.

IV. Lessons Learned From the Experience

A. Microgravity holds many surprises and mysteries. It is difficult to predict what will happen in an environment that is unfamiliar and out of the ordinary. This in turn helps us to understand the many challenges NASA faces in space exploration.
B. A reduced gravity environment is a challenging place to work. It is understandable why astronauts train for so many years in simulated environments on Earth before actually going into space. The amount of time it takes to learn to simply control your body would make their time in space less efficient.
C. Turning upside down and spinning makes you sick! On the other hand, just hanging out and having a great time is worth every form, report, e-mail and effort required to participate in this opportunity!

V. Outreach Events Performed/Planned (A simple list.)

A. Videoconference from Houston with fliers – media and community members were invited and attended this conference. (completed)

C-9 Final Report
Battle Academy
Chattanooga, Tenn.
Submitted by: Debbie Rosenow

B. A follow-up session took place with Dr. Dan Adamek. We met with students who viewed the video footage taken by the camera mounted inside the experiment and made observations about the fluids. Students also conducted experiments related to wetting in order to understand more about the reaction of the fluids during the flight. (completed)
C. Experiment footage and process was set up and modeled during Spring Science Night.
D. Video footage, photographs and an explanation of the flight experience is being shared with other grade levels in the building. (on-going)

VI. Student Educational Outcomes of Participation in This Program

A. Students have a greater understanding about microgravity and how it affects various fluids.
B. Students understand that science experimentation, particularly experiments in space, is not about being RIGHT – it is about the process.
C. Students are more aware and have put into practice the idea that science experiments are often modified, changed, or reorganized in order to get a better or different result.
D. Students know observation is key!
E. Students can explain the concept of wetting and surface tension and why the fluids responded the way they did during the flight.
F. Students can explain what the C-9 is, what NASA uses the aircraft for, what a parabola is, and why astronauts use flight time to train.

VII. What evidence will be collected to assess educational impact on the students?

Students who were directly involved in the experiment procedures kept documentation of their observations, thoughts, hypotheses and reactions before and during the flight week. After their session with Dr. Adamek, they were asked to reflect on what they had learned from the experiment, what they had learned about the C-9, and how they thought participating in this experiment helped them understand more about space exploration and science experimentation in space. Much of the information contained in this report has come from students' responses in the form of journaling or discussion.

VIII. Teacher or Community Outcomes of Participation in This Program

Participating in this program has increased our knowledge of and ability to share information about microgravity and space exploration with students. The flight in itself was incredibly educational but the other opportunities paired with it, such as the tour of JSC, gave us greater insights into the mission of NASA. Going through the scientific part of the experiment built my understanding and knowledge of scientific concepts once unknown to me. Our NASA mentor was outstanding and we couldn't have had a better team to work with.

The community has become much more aware of our pursuit to engage students in science and increase their knowledge and interest. Our participation in this program helped to solidify many of our partnerships that support us as a NASA Explorer School.

We continue to feel extremely fortunate and honored to have been selected to participate in this opportunity. It has had a tremendous impact on the students directly involved and will continue to impact many students to follow. Thank you for an incredible experience and giving us a glimpse into a world the average teacher may never encounter. We appreciate your professionalism, patience, kindness and hospitality. We can only hope that many other schools will have this amazing experience so that more teaching minds can be expanded and more fires of interest and excitement can be lit in the educational souls of students.